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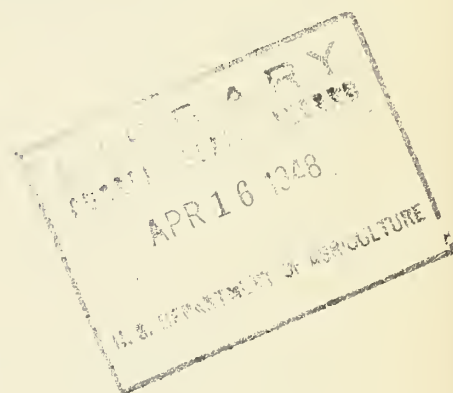
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# MARKETING ACTIVITIES



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U. S. Department of Agriculture  
Production and Marketing Administration  
Washington 25, D.C.

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Address all inquiries to  
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# Fruit and Vegetable Market News Service

By C. D. Schoolcraft

Until the latter part of the nineteenth century fresh fruits and vegetables available to consumers were limited to those highly perishable commodities grown in local market garden areas during the "home-grown" season, and to products of low perishability such as potatoes, which could be shipped long distances and stored for some time without ice.

During the last half of the century the development of the refrigerator car and of facilities for manufacturing ice opened up extensive producing and shipping areas at great distances from the large consuming centers of the country. In the far West and the extreme South new winter producing areas grew up which made it possible for the northern and eastern housewife to serve almost every day in the year vegetables which previously were available only during the local growing season.

## Change in Diet

The year-round availability of a wide variety of fresh fruits and vegetables, along with a more sedentary way of life for a large part of our population, brought about a marked change in our national diet soon after the turn of the century. We turned from a heavy bread, potato, and meat diet to one which included larger quantities of a wide variety of fruits and vegetables.

The rapid development of this new and far-flung perishable industry brought with it problems and abuses which it was felt could be corrected, to a degree at least, by some means of quickly collecting and disseminating accurate unbiased information on conditions and prices in both the market places and producing areas. In the early days the fruit and vegetable industry had no means of knowing exactly where the shipments were going, what was moving from the various shipping areas, or what was available in the markets at any given time. This resulted in market gluts and low prices in some cities at the same time supplies were extremely short and prices high in other cities. In soliciting consignments, certain firms and persons put out misleading information as to the market situation or made false returns on consignments. These the grower or shipper was forced to accept simply because he had no way of knowing the facts. Shippers and growers likewise put out exaggerated stories on the quality of their produce, size of crops, weather damage, and prices received. Despite this dismal picture it should, in fairness, be pointed out that there were many honest operators who felt that dissemination of information by an unbiased agency would benefit the whole industry. It was for this purpose that the market news service was established.



The fruit and vegetable market news service was established to provide all segments of the industry from the grower to the retailer with current unbiased information on supplies, movement, distribution, demand, prices, and other factors affecting the marketing of fruits and vegetables. The ready availability of complete information on factors affecting the market goes far toward putting all branches of the perishable industry on an equal bargaining basis. The market news service collects information while the markets are being made and distributes this information as rapidly as modern communication facilities will permit.

The market news service was organized in 1915 under the Office of Markets and Rural Organization. Reports during that year covered only a few seasonal commodities--apples, peaches, pears, cantaloups, strawberries, and tomatoes. Shipping point offices were located at Crystal Springs, Miss.; Hammond, La.; Jacksonville, Tex.; Brawley, Calif.; Mesa, Ariz.; Rocky Ford, Colo.; and North Yakima, Wash. "Market stations" were operated at Baltimore, Buffalo, Chicago, Kansas City, New York City, and St. Louis. Members of the trade in some other cities furnished information as requested. Reports were published at both the city offices and temporary field offices.

A complete report including all available information was published at Washington. From this early beginning the service has developed until today permanent market offices are maintained in 21 of the larger cities and temporary field offices at about 40 points during the active marketing season each year. The U. S. Department of Agriculture and many States have entered into Federal-State agreements which make possible a greatly expanded service as compared with that which could be provided by the Federal Government alone.

#### Collection of Information

The market news service is in effect the eyes and ears of the fruit and vegetable industry. The market reporter on the city market spends several hours each day, during the period of active trading, on "Produce Row." He observes the volume and quality of offerings. He talks to sellers and buyers to obtain the latest information on demand, movement, market trends, and detailed prices on the various commodities. By this close personal contact with all branches of the trade and observation of prevailing conditions he is able to provide unbiased and accurate information on conditions and prices on his market. The market news representative in the shipping area is in contact throughout the day with shippers, loaders, buyers, growers, and others concerned with the marketing of the local crops. He obtains a complete picture of volume of loadings, quality, demand, market trends, and prices. He appraises the effects of weather on the crop and market. In the light of this background information, he then prepares a concise statement on conditions and prices for his producing and shipping area. This area in some cases may be a relatively small concentrated producing district. In other cases it may represent a State or even parts of several States.

The value and accuracy of market reports to a very large degree depends on the cooperation and reliability of the market reporter's con-

tacts. Through the years the industry has recognized that a complete, accurate market report can be of great value. By the same token an inaccurate report may not only be misleading but can at times cause considerable monetary loss. For this reason the major part of the industry has been unusually cooperative with a view to keeping the reports as accurate as possible.

### Dissemination of Information

Market news is made available to all who may need it, and as rapidly as present-day means of communication will permit. The mail, telephone, telegraph, newspapers, radio, and personal contact are all used. Each of these means of communication fills some special need.

Mail.--Mailed mimeograph reports form the basis of all dissemination from either permanent or temporary field offices. They are the official records of the market news service and as such may be certified, upon request, by the Secretary of Agriculture for use in court.

The reports from a permanent city office show in detail: Market conditions and prices on all commodities sold on the local wholesale market; a record of carlot receipts (and in some markets truck receipts) during the period since the last report; local carlot track holdings of the current morning; a report on carlot shipments of the previous day; information from principal shipping areas; and in some cases information from competing terminal markets.

A somewhat similar report is published daily by the seasonal offices. The information on these reports is largely confined to the commodities currently moving from the particular area.

Market reports may be obtained by mail, free of charge, by all who need them. Some operators, especially in shipping areas, may need terminal market reports only during a certain marketing season. In such cases, requests should be made only for a specified period, since it is uneconomical to provide reports when they are not needed or used.

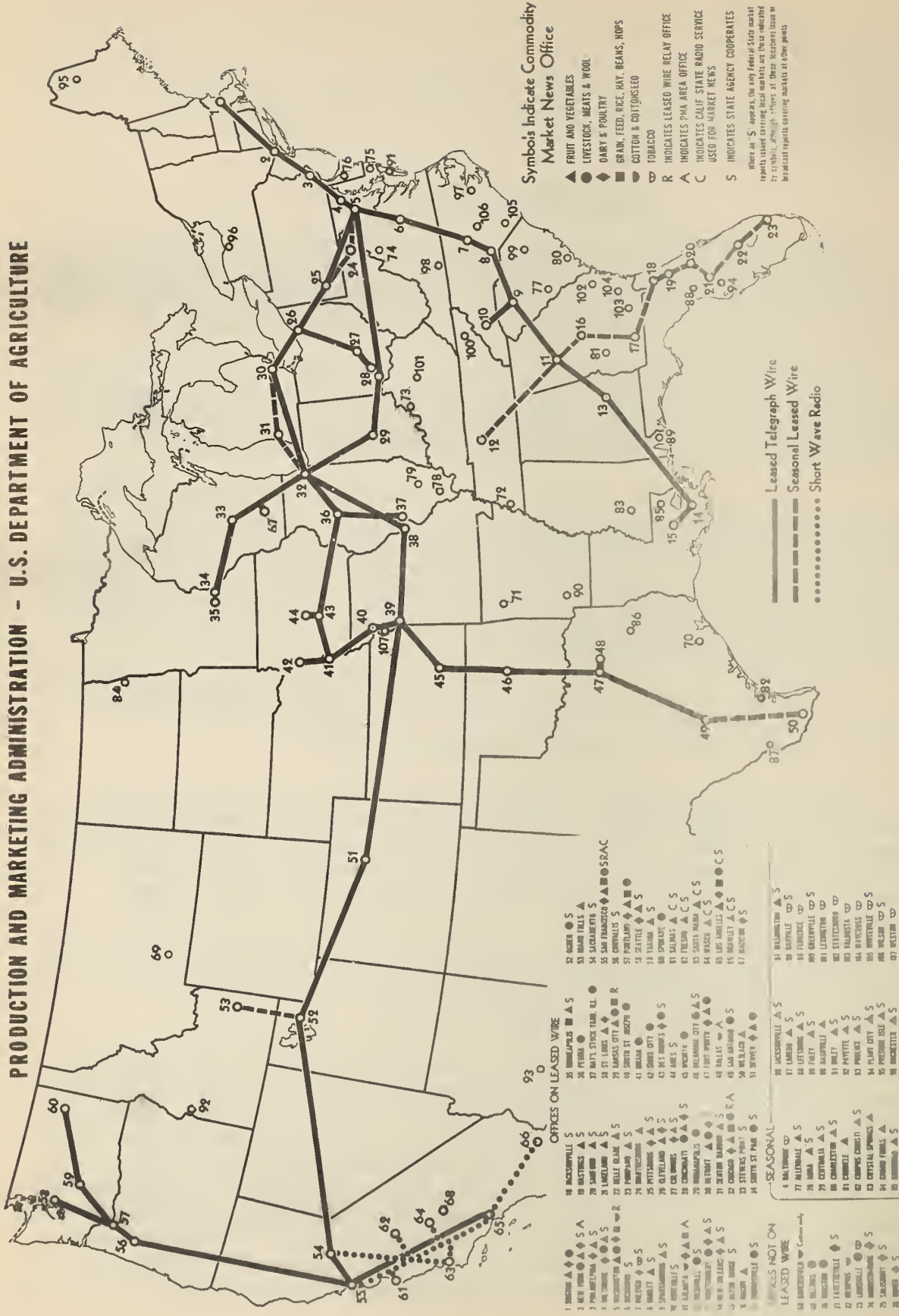
Telephone and telegraph.--Insofar as time and facilities permit, the market news representative will provide early information by phone. Special information can be briefly supplied to out-of-town firms or individuals by telegraph or telephone collect.

Newspapers.--Many metropolitan newspapers, especially those with a rural circulation, carry fairly complete market reports on local wholesale prices and conditions, furnished to them by the local market news office. Rural dailies in shipping areas carry information on local crops. Rural weeklies may carry reviews and special articles of local interest. In nearly all cases market reports carried by newspapers are not as complete as the official mailed reports, but do include the most important features of the report. Newspapers may be delivered earlier than mailed reports in some sections. Experience has shown that requests to newspapers by readers may be instrumental in having market reports of local interest published.



# MARKET NEWS OFFICES AND LEASED WIRE SYSTEM

## PRODUCTION AND MARKETING ADMINISTRATION - U.S. DEPARTMENT OF AGRICULTURE





Radio.--At present several hundred radio stations carry market news on regularly scheduled broadcasts. Radio information is in nearly all cases adapted to the specific need of the listening audience. A city station may broadcast a report of local wholesale prices, or, if it is adjacent to a producing area, the prices that are received for local products. A station serving a shipping area usually provides a report on the commodities currently moving from that area. Radio cannot replace the printed market report. With radio there is no permanent record to which the listener may refer in the future. Time limitations prevent the use of all the detail carried in the printed report. Radio, on the other hand, provides a valuable auxiliary means of getting out early information over a broad territory. The press associations are instrumental in distributing market news, to both radio and newspaper members or subscribers.

Leased wire.--During the early years of the market news service it was recognized that some means must be developed to provide a rapid interchange of a large volume of information among all offices. The telegraph and telephone could not provide such a service on a national basis. To provide an internal communication system, an extensive mileage of wire was leased for the exclusive use of the market news service. This system now includes about 8,700 miles of wire and connects all offices except a few seasonal offices where distance makes the use of leased wire facilities uneconomical. In most of these offices a relay by teletypewriter service provides fairly rapid service.

### Contents and Use of Market Reports

The principal use of market reports is by growers, shippers, dealers, and others who deal in fresh fruits and vegetables, in planning the conducting their day-to-day marketing operations. The daily market reports and summaries issued from the various field offices and Washington provide the basic information for many economic, statistical, and long- and short-range marketing studies. Price series covering a number of years often indicate the profitable and unprofitable crops for a given area. A study of production in relation to prices may indicate needed adjustments in acreage or changes in farm enterprises in a given area. No long-range production and marketing program can be developed without full consideration of the ability of markets to absorb production at prices which will return costs plus a profit. A study of demand and price in relation to quality, pack, variety, and other characteristics of a commodity may point the way to new or revised methods of production, grading, and packing. The value of market reports depends largely on the specific needs of the user and the adaptation of the information which will best serve his purpose.

### The Market Report

Let us consider fully the daily mailed report issued by each office. All other reports, in effect, are special adaptations of the daily report. Reports issued by all permanent market offices are basically the same although they may differ in detail. The same thing applies to reports issued by the seasonal field offices.

All terminal market offices publish daily reports covering prices on the local wholesale market, accompanied by comments on market trends and in some cases on the supply and demand situation. In most markets the wholesale price reported represents the first sales by the original carlot or trucklot receiver--in other words sales in wholesale lots by the original receiver to jobbers, chain-store buyers, and other large buyers. Small lot sales by wholesalers or jobbers to retailers are not generally included in reports in most markets. In some smaller markets most sales by original receivers are made direct to retailers. In these cases the sales are designated "sales to retailers." In some large markets sales in carlots or sales by brokers are common. Such sales are designated on reports specifically according to type of transaction. Prices and related market information are obtained by market reporters through observation of conditions and interviewing sellers and buyers during the hours of active trading. The available supplies, quality, and condition and the rate of movement are closely watched. A record of prices--by State of origin, type of container, grade, size, quality, and all other factors affecting price--is obtained from dealers. By considering all these factors fully, the reporter is able to prepare a concise statement of conditions and prices on the current market.

### Price Quotations

Price ranges, in general, are used in fruit and vegetable market reports. The principal range reported in most cases covers the high and low prices on stock of "generally good merchantable quality and condition." Lots of exceptionally good quality or poorer than "generally good" are covered by quotations outside the range, accompanied by qualifying statements. Thus, we might find a price on peaches: "Bushels, Elbertas, US#1, 2 inches and up \$3.00-3.25 ("generally good" being understood), few high color \$3.50, fair condition, soft \$2.50, showing decay low as \$1.50." Such a quotation conveys definite market information to the grower, shipper, dealer, or buyer who knows something of the quality and condition of current market offerings. A simple statement, as "Peaches--1.50-3.50," which covers the above range of prices without qualification, means very little. The narrower the range, the more valuable the quotation. On some markets, products of similar characteristics sell within a very narrow range. On other markets, ranges may be very wide. In using market reports the reader must recognize the effect of variety, grade, size, quality, and condition on price. The grower or shipper who puts a poorly graded product on the market cannot expect to obtain the top price in competition with good-quality offerings. In many sections a close study and full recognition of the relation between quality and price have been strong factors in improving grading and packing practices.

It is impossible to determine exact average prices from ranges carried in market reports, except in the case of auction reports in which an exact weighted average can be calculated. In using market reports for settlement of claims or in the development of statistical series it is common practice to consider the mid-point of a price range as the "average" although the actual average, it is known, may be above or below this point.



## Market Trends

"Market" represents the correlation of opinions of buyers and sellers which results in sales. "Market" phrases are used in market reports to indicate comparisons with conditions which prevailed on the previous day, or conditions expected on the day following, or both. Comparison of the present price level with past and future levels creates the market tone. The actual price level is not a criterion of the "market tone." For example, on a commodity which would normally sell at \$3 per unit the market might be weaker with a price level of \$6 or stronger with the price at \$1, depending upon whether present price trends are moving up or down. Price changes which are due to differences in quality or condition are not interpreted as changes in market trends. In other words, an increase in price levels due to improved quality would not necessarily represent a stronger market. Likewise, the market might be either stronger or weaker with no change in prices provided quality changes were factors affecting price.

Terminology.--In fruit and vegetable market reports "market" phrases are used in the following sense:

"Market stronger" indicates a condition of actual and general price advances.

"Market strong" indicates an upward trend with a bullish market sentiment that anticipates further advances. The expression may also be used to describe a situation where prices are at high levels and no immediate decline seems in prospect.

"Market firm" indicates a condition of increasing confidence on the part of most sellers. Prices are either holding at the level of the day before or are a shade higher.

"Market steady" indicates a condition in which there are no appreciable price changes or trends in either direction and no definite sentiment that any immediate market changes are in prospect.

"Market dull" indicates a period of relative market inactivity but no definite tendency toward market changes.

"Market unsettled" indicates a condition of market uncertainty, with a lack of agreement among the trade on whether there is a stronger or weaker tendency to the market. It may also represent a waiting attitude pending the development or outcome of factors which might affect the market, such as storm damage and labor difficulties.

"Market weaker" indicates a condition of actual and general price declines.

"Market weak" indicates a downward trend with a market sentiment that anticipates lower prices.

"Market demoralized" is used only in unusual cases. It indicates a

condition in which the market is oversupplied and sales cannot be made except at very low prices.

All these market phrases may be qualified as to degree by terms such as "slightly stronger," "slightly weaker," "about steady," and "very dull."

### "Demand" Statements

As used in market reports, "demand" represents the desire for a commodity coupled with the ability and willingness to pay for it; that is the "effective demand"--the demand which results in trading at prevailing market prices.

"Practically no demand" indicates a stagnant condition of the market with very little interest among buyers and very few sales.

"Demand light" is used when buyers are few and far between and the total volume of business is small.

"Demand slow" is used when trading is lagging and buyers are doing much shopping around before buying. The total volume of business may range from very light to slightly less than moderate.

"Demand moderate" indicates that buyers are purchasing in a normal way, without excitement or lag.

"Demand good" indicates firm confidence among buyers in the general marketing conditions.

"Demand exceeds supply" usually indicates a condition of light supply when most buyers are unable to obtain stock for immediate delivery. At times a very good demand may create the same situation even though supplies are moderate or liberal.

### "Supply" Statements

Statements on supply are not generally shown in market reports. Reports on receipts and track holdings give a good indication of available supplies. Supply statements should be considered in relation to other factors prevailing on the market. A definite known quantity or the number of cars available may not under all conditions represent the same relative supply situation. For example, 2 cars of strawberries in midwinter might represent heavy supplies, whereas 20 cars at the height of the strawberry season might represent only moderate supplies on the same market. In general, the following definitions of supply terms apply in market reports:

"Supplies light" indicates less than the market would normally absorb without some strengthening.

"Supplies moderate" indicates about what would normally supply all needs on the market without a carry-over.



"Supplies liberal" indicates slightly more than can be absorbed although there may be no noticeable weakening of the market.

"Supplies heavy" as a rule indicates a considerable oversupply often accompanied by a distinct weakening of the market.

The foregoing terms may be qualified by such words as "fairly" and "very."

### Transportation Information

Carlot shipments.--Arrangements are maintained by the Washington office of the market news service whereby each railroad and boat line in the United States, and also the express company, telegraphs early each morning a report of shipments of fresh fruits and vegetables during the previous day up to midnight, by commodities and the State from which they were shipped. These telegrams are consolidated in Washington so as to show total rail, boat, and express shipments for about 46 commodities by States of origin. Some States are further broken down into shipping districts. Imports are also reported as shipments as of the date they pass the port of entry.

The shipment report is released from Washington about 9 a. m. EST, by leased wire and telegraph. All terminal market offices publish this entire report. Seasonal field offices publish shipments of commodities of local interest. This shipment report is not compiled by any other agency. No other industry has as complete and current reports on rail and boat movement of its commodities as the fruit and vegetable industry. A daily study of these reports will enable a shipper, receiver, or other operator to determine fairly well the supplies currently moving to market from the various shipping sections.

Carlot arrivals.--Terminal market offices obtain from all local rail and boat lines daily reports showing arrivals of all fruits and vegetables delivered within the metropolitan switching limits, broken down by commodity and State of origin. These represent receipts for the previous 24 hours (48 or 72 hours over week-ends or holidays) up to about 7 o'clock of the current morning. These figures cover receipts at wholesale markets, team tracks, chain-store warehouses, cold storages, and all other points where delivery may be made. A study of these reports shows exactly what is arriving in a city by rail and boat. Along with reports on truck receipts where collected they show the rate at which products are moving into the market. Shippers and receivers watch these reports closely in gauging their sales and purchases.

Cars on track.--This figure for each commodity is obtained from the rail lines at the same time as the report on arrivals. It represents the number of cars--broken and unbroken--held on tracks on the current morning. It gives a good indication of available supplies on the market, especially when taken with the figures, or a reasonable estimate, on truck receipts.

Carlot unloads.--These statistics represent the number of cars unloaded within the switching limits of a city during the same period as

the arrivals are reported. Unloads are not published on a daily basis except in New York City. They are summarized and published on a monthly and annual basis. A study of these reports gives a reasonably good indication of consumption in a metropolitan or market area, although the rail figures must be adjusted to take care of volume brought in by truck.

Truck receipts.--Information on daily truck receipts is now collected on 11 markets. In most cities, figures represent volume arriving at wholesale markets, chain-store warehouses, and in some instances at farmers markets. In general no record is obtained of receipts at independent retail stores or fruit stands. Truck receipt figures are released in carlot equivalents by commodity and State of origin.

Original destinations of shipments.--In some shipping sections railroads furnish a record on point of original destination for each car of specific commodities shipped on the previous day. These are partially corrected by early diversions. A part of these cars may be later diverted before reaching the final destination. A study of destination reports indicates the approximate volume moving to the various markets. A seasonal summary of a shipping "deal," based on destination or passing reports, gives an excellent picture of the national distribution of the crop from a specific area.

Carlot passings.--For some shipping sections, original destination reports are supplanted by or supplemented with reports on carlot passings. These are based on reports by railroads, showing the destinations of individual cars passing through certain points during a given period. Some principal passing points used are Potomac Yards, Virginia; Jacksonville, Fla.; Waycross, Dupont, and Baldwin, Ga.; Cincinnati (including Russell, Ky.); Hornell, N. Y.; St. Louis and Kansas City; Fort Worth, Houston, and Hearne, Tex.; Barstow, Colton, Roseville, and Sacramento, Calif. For short shipping seasons a few additional passing points may be used. A daily study of passing reports shows the approximate number of cars headed toward the various markets. Many annual or seasonal distribution tables are based on passings reports.

Diversions or reconsignments.--For all practical purposes these two terms are synonymous. They represent a change in the final destination of a shipment. Diversions may be made either while the car is in transit or after it has arrived at a destination. Diversion privileges are covered by railroad tariff regulations. In general the diversion privilege cannot be used for a back haul except in a higher rate. On market reports diversions are used to correct or adjust distribution reports based on passings and (or) original destinations.

The Washington office issues weekly and annual summaries of carlot shipments by commodity and State of origin; individual State summaries showing shipments by commodity, month, county, and billing station; and an annual report showing carlot unloads of important fruits and vegetables in 100 cities. Copies of these reports may be obtained by addressing the Market News Division, Fruit and Vegetable Branch, Production and Marketing Administration, U. S. Department of Agriculture, Washington 25, D. C.



# Dairy Byproducts

By Earle O. Whittier

Whenever more milk is produced than is needed to supply the demand there is the problem of disposing of the surplus. One solution is to increase consumption by urging greater use of milk, a slow method, or by reducing prices, not always a feasible method. The problem usually is partly solved by converting the surplus milk into relatively nonperishable products like butter, whole-milk cheese, evaporated and sweetened condensed whole milk, and dried whole milk--products that can easily be stored or transported to places where they are needed.

The greatest money value of whole milk is in the milk fat, so primary emphasis is put on products containing all or most of the fat. Its value, though, makes it impractical to consider the use of milk fat for nonfood purposes; many cheaper fats are available and suitable for such uses. It is generally true that use in food is the most gainful way to utilize all the components of milk.

The production of butter and cheese from surplus milk leaves as byproducts skim milk, buttermilk, and whey, which also are byproducts in the making of cream, butter, ice cream, and cheese from nonsurplus milk. The problem of disposal of surplus milk includes, therefore, not only the primary one relating to the milk fat and foods containing milk fat, but also finding use for the practically fat-free byproducts.

The problems of disposition of surpluses and byproducts of the dairy industry are not new. They were becoming increasingly acute in the years before the war. During the war there were other problems--insufficiency of food and feed--but they are gradually disappearing again, and the utilization of surpluses and byproducts requires increased attention.

## Prejudice Against Fluid Skim Milk as Food

A general prejudice against the use of fluid skim milk as food has existed among our people, presumably mostly because so much of it has been fed to animals. In what degree skim milk is less palatable than whole milk is a question each person must answer for himself. But the nutritive value of skim milk is not a matter of opinion. It is a matter of fact. Skim milk lacks the fat and the accompanying vitamin A of whole milk, but is equally rich in protein, lactose, calcium, phosphorus, and riboflavin. The diets of many people lack adequate calcium and riboflavin. Most of the skim milk used as food in the fluid condition is consumed as chocolate milk and cultured buttermilk. This indicates that added or developed flavor is an effective means of making skim milk attractive as a drink and has led to efforts to produce other flavored milks. The canned caramel-flavored milk, developed by USDA's Bureau of Dairy Industry in conjunction with a manufacturer of evaporated milk, is one result of such efforts, but, since the recommended formulas include some fat, it is not strictly a skim-milk product.

The conversion of skim milk into cottage cheese is a convenient means of concentrating the protein for easier distribution and for marketing in a more popular form. Nutritively, cottage cheese lacks most of the riboflavin, lactose, and minerals of skim milk, but it is an excellent source of protein. Improvements in the texture, palatability, and uniformity of cottage cheese in recent years, resulting from work in the Department and several State experiment stations, have increased its popularity.

Skim milk in its concentrated forms is a convenient source of non-fat milk solids in ice cream. The proportion that can be used has been limited by the tendency of the lactose to crystallize in the ice cream. Because the crystallized lactose is hard and slow to dissolve, the ice cream sometimes had an objectionable sandy texture. To solve the problem, a low-lactose skim milk has been developed.

If skim milk is concentrated sufficiently to cause lactose to crystallize, it becomes so viscous that the crystallizing lactose is finely divided and difficult to separate. But if cane sugar is added to the skim milk before evaporation, the concentrated skim milk is thin and the lactose crystals are large and can be separated easily by filtering in a centrifuge. Since cane sugar is needed as an ingredient of ice cream, it can be supplied in the skim milk as suitably as at a later stage. The lactose removed from the skim milk is a valuable product. This procedure has been used profitably in dairy plants that make ice cream.

#### Fluid Skim Milk in Bakery Products

The use of fluid skim milk in bread and other bakery products is limited, largely because of its perishability and its bulk. Plain and sweetened condensed skim milk are popular sources of milk solids in bakery products, the latter being an especially convenient form when both milk solids and sugar are required. Dry skim milk is the form most generally preferred for incorporation in foods because of its high degree of concentration and its excellent keeping quality. It improves the texture, physical appearance, and flavor of many food products, and increases their nutritive value. The largest use of dried skim milk is in bread. Department chemists showed in 1927 that the heating of skim milk to 85° to 95° C. for a short period before drying had the effect of improving the baking quality of a bread dough mix in which the dried skim milk was used. As a result, practically all the skim milk dried for use in breadmaking in this country is given this heat treatment before drying.

When only the protein of skim milk is required, as in cheesecake, pot and baker's cheese are used. In cities in regions of meager milk supply it has been the practice for some years to make cottage cheese from reconstituted dried skim milk. Recently technicians have demonstrated that a satisfactory baker's cheese can be made from dried skim milk. This makes it possible for bakers in large cities at a distance from milk-producing areas to obtain freshly made baker's cheese.

One possibility of utilizing both skim milk and surplus potatoes is in making a wafer containing one-third skim-milk solids and two-thirds



potato solids. Boiled potatoes and skim-milk solids are thoroughly mixed and seasoned and the mixture is extruded as a ribbon, which is then dried and toasted to a light brown. These wafers have a cheeselike flavor and the texture of potato chips. Having no fat, they will keep for a year or more. This special product has not yet been commercialized, but in the procedures involved are suggestions for many similar products.

### Casein

The only industrial products manufactured directly from skim milk are acid-precipitated and rennet-precipitated casein, which are relatively pure chemical products. Purified casein is suitable for food, but it is not necessary or even desirable that casein be purified for food use. Cottage cheese and cheeses of the harder varieties are essentially casein of the acid-precipitated and rennet-precipitated varieties, respectively, that have not been freed from other food substances present in milk. But for industrial use, it is necessary that casein be refined by removing the non-protein organic nutrients to as great a degree as possible.

The chemical differences between acid-precipitated casein and rennet casein are not well understood, but a mixture of rennet casein with a small proportion of water is characterized by its formation of a plastic mass that is suitable for the manufacture of buttons and many other articles, such as umbrella handles, buckles, and costume jewelry. Plastic casein would have greater use were it not that no satisfactory way has been discovered to prevent the finished products from expanding in humid air and contracting in dry air. Efforts have been made to find plasticizers for casein so that it can be used as a molding powder rather than as an extruded plastic, but these efforts have been only partially successful.

The average quality of the acid-precipitated casein produced in the United States has improved markedly in the past 20 years. The devising of the grain-curd process in the Bureau of Dairy Industry and the development by several manufacturers of continuous processes of manufacture, all requiring careful control of acidities and effective washing, have been the major contributions to the wider production of uniform, high-grade casein. The quality of casein is highly important to the paper-coating industry, which used about three-fourths of the total supply in the prewar years. Quality is of less importance to the casein adhesive and casein paint manufacturers, who used 10 and 5 percent, respectively, of the prewar supply. For the newer uses in fabrication of synthetic rubber and in making casein fiber, it is essential that the casein be of high grade.

The popular and relatively new water-emulsion paints usually contain casein to the extent of about 3 percent of the total solids. Casein is used in these paints principally for its emulsifying action, but it also functions as a binder. The use of the insecticide DDT in water-emulsion paints is expected to increase the market for casein.

Although the quantity of casein used in synthetic rubber is small, this use is important, since no adequate alternative substance has been found. The casein is said to act as an internal lubricant, and thus prevents excessive heating of synthetic rubber articles, such as tires, when they are flexed during use. The quantity of casein required in the future for this purpose depends, obviously, on the extent to which synthetic rubber is used, but there is a probability that casein will be used also in tires made from natural rubber.

A thin, transparent wrapping material made from casein was in limited commercial use in the early 1930's. Its production was abandoned because it developed a cloudy appearance and brittleness. A recent patent on improvements in the manufacturing process indicates the possibility that it may again reach the market.

### Casein Used in Textile Manufacture

Casein has been used in small quantities in the textile industry for years for bonding, loading, finishing, and waterproofing fabrics, but only since 1940 has there been commercial development from casein of an artificial fiber that seems to be finding a definite place among our textile fibers. Application for the first practical patent for making fiber from casein was filed in 1935 in Italy, and commercial production was begun there the following year. The first of a series of eight patents resulting from research in the Bureau of Dairy Industry was issued in 1939 and, in the 6 years immediately following, about 40 United States patents were granted to other inventors on phases of this development. Currently, the production of casein fiber in this country, which began only a few years ago, probably approaches 10 million pounds a year.

The conversion of the casein of skim milk into textile fiber is not a process that can be carried out on the farm. The casein must be made by a controlled procedure possible only in a dairy plant or a plant making casein exclusively. The conversion of casein into fiber requires the knowledge and experience of textile engineers and equipment similar to that of plants producing viscose rayon. The casein is dissolved in alkali, various other substances are added, and the solution is extruded through the fine apertures of a spinneret into a bath containing acid and dehydrating and hardening agents. Next, the fiber is chemically treated. It is then cut into staple lengths, after which it is either felted in mixture with hair or wool or spun into yarn, which is woven into fabrics in mixture with cotton, rayon, or wool yarn. Most felt hats sold in the United States contain some casein fiber; garments and fabrics containing casein fiber may be purchased in stores.

Among the characteristics that have established casein fiber in the textile field are its property of felting in mixture with hair and wool, whereby it acts as an extender of these more expensive fibers; the soft feel imparted to fabrics that contain it; and the fineness of fiber possible--finer than the finest wool. The fact that casein fiber has somewhat less tensile strength than wool, especially when it is wet, has prevented its being woven into fabrics without admixture of other, stronger fibers. Fibers from soybean protein and from peanut protein resemble



casein fiber but do not equal it, and have not yet been commercialized. The synthetic nylon is similar chemically to casein and offers serious competition since it is now being produced as a woollike fiber.

### Buttermilk and Whey

The uses for buttermilk are similar to those for skim milk. It is a desirable component of bakery products and other foods, the condensed and dried forms being the most convenient ones. Fluid and condensed buttermilk are fed to animals and dried buttermilk is fed in mixed feeds. Casein made from buttermilk is different in many respects from skim-milk casein. For most purposes it is less desirable than casein from skim milk, but for casein paints it is especially suitable, provided it is used in paste form without being dried.

Despite the need in our diets for the calcium, phosphorus, and riboflavin readily available in whey, we drink no whey and consume as food practically none of it in its concentrated forms, except as a component of other foods. Feed uses account for the largest proportion of whey, increasing amounts being used in the dried condition, especially for feeding chickens. Dried whey, besides being of high general nutritional value, is of specific use in the chicken industry, since the lactose acts as a preventive of coccidiosis, and riboflavin is essential to hatchability of eggs and optimal growth and aids in preventing curled toe paralysis. The most recent advance in manufacturing dried whey for feeding chickens is the use of bacteria to synthesize riboflavin in the whey before drying. This procedure was commercialized during the war when sufficient equipment was not available to dry enough whey to meet the needs for riboflavin in feed. It is possible to concentrate the riboflavin in whey, either normal or enriched, by absorbing it on lactose. By partly concentrating the whey, some of the lactose is caused to crystallize. On concentrating further, more lactose crystallizes, carrying with it most of the riboflavin of the whey. By careful regulation of the process, a bright yellow sugar can be obtained containing .3 milligram of riboflavin per gram. Four grams of this lactose--about one-seventh of an ounce--can furnish a person's full daily requirement of riboflavin. This yellow lactose is also suitable for addition to bread and other foods to increase their riboflavin content.

Whey can be used as an ingredient in other foods either as fluid or concentrated whey. Fluid whey may be combined with vegetable juices, such as tomato juice, to produce beverages of improved food value, or with tomatoes, peas, or beans to produce soups. In acid soups, such as tomato, whey has the advantage over skim or whole milk that it does not form lumpy curds on heating, but, instead, gives a fine-textured, smooth body.

Sweetened condensed whey is a new product developed to provide a cheap nonperishable form of whey solids to be used wherever sugar is also needed. It is suitable for use in candies, especially those of the fudge type. It adds nutritive value, gives a smooth body, and aids in keeping the candy soft and fresh. Sweetened condensed whey has been used successfully also in canned puddings, and dried whey in canned brown bread. Formulas for all of these products have been developed in

### Lactose and Lactic Acid

Lactose has been made from casein whey for many years and used mainly in infant foods. The suddenly increased demand during the war for lactose to use in producing penicillin came at a time when domestic casein production was greatly reduced, but when cheese production was greatly increased. Consequently, cheese whey was much more readily available than casein whey. The Department had accumulated information on the making of lactose from cheese whey which was published as six practical methods, each adapted to some special condition or requirement. These processes differ in cost of operation, in the purity of the lactose produced, and in the solubility of the whey protein obtained as a byproduct. Several companies have been producing lactose from cheese whey and have thus bolstered the supply needed in making penicillin.

Fermentable sugar present in dairy byproducts can be utilized in the production of alcohol and organic acids. One plant in the United States is producing alcohol from whey and converting the alcohol into vinegar. The only organic acid being produced directly from whey by commercial fermentation is lactic acid. The Bureau of Dairy Industry devised a process whereby more than 90 percent of the lactose in whey is converted to lactic acid in 24 hours. This is a continuous process, in which raw whey flows in at one end of a tank and fermented whey flows out at the other. The commercial process is a batch process requiring a 48-hour turnover. In brief, the whey is fermented by a bacterial culture, the lactic acid being neutralized from time to time by lime in order that the bacterial action may continue. When the sugar is all fermented, the whey is boiled to coagulate the whey protein and the clear liquid is evaporated to cause calcium lactate to crystalize. The calcium lactate is removed on a filter and, after purification, is treated with sulfuric acid to convert it to lactic acid.

If increased quantities of lactic acid are to be made, greater use for it must be found. To this end two bureaus of the Department have developed procedures for converting lactic acid to acrylates. These acrylates, when polymerized, are flexible, glasslike substances that have use as plastics and in waterproofing cloth, and that can be converted into rubberlike materials. But acrylates can be made more cheaply from other starting materials and this has aroused interest in ways of cheapening the present expensive method of refining--which is the largest proportion of the cost of lactic acid. This acid cannot be crystalized or distilled by any method that is commercially practical, but it can be combined with alcohols to give lactates that can be easily distilled and thus purified. Three patents on such procedures have been issued to workers in commercial laboratories. These purified lactates can be shipped in undiluted form and in inexpensive containers, in contrast to dilute lactic acid that must be shipped in expensive, noncorrodible containers. At the point of use the lactates can be converted back to lactic acid of any desired concentration by boiling with water. It is reasonable to expect that some of the needed reduction in cost of lactic acid to the user can be attained by applications of these methods of refining and handling.



# Cold Storage of Apples

By W. V. Hukill and Edwin Smith

Methods of storing apples have improved a great deal in recent years. The progress does not depend so much on new discoveries or revolutionary changes as on closer attention to practical ways of providing the best conditions for keeping the fruit good.

For best results in storage, apples must be harvested when mature but not fully ripe and stored under conditions that will arrest the rate of ripening and the growth of rot-producing fungi, that will avoid shriveling, and that will not result in low-temperature disorders. With a few exceptions, these conditions call for a storage temperature of 30° F., or slightly above the freezing point of apples, and a relative humidity of 85 percent. A few varieties grown in certain regions are susceptible to low-temperature disorders and have to be stored at temperatures of 36° or 38° F. This has resulted in the development and use of controlled-atmosphere storage. McIntosh apples can be stored at 40° in a controlled atmosphere of 5 percent carbon dioxide and 2 percent oxygen for longer periods than they can be stored in air at 32°. Varieties, however, have specific atmospheric requirements as to this type of storage.

## Temperature and Chemical Change

Complex chemical changes in the tissue of apples continue during ripening until the fruit becomes overripe and unpalatable, with subsequent collapse. The changes are retarded as the temperature is lowered; thus the storage life of the fruit is lengthened. Research has shown that at 30° F. about a fourth more time is needed for apples to ripen than at 32°. Apples standing in an orchard at 70° may ripen as much in 3 days as they would during a month's storage at 30°. When held in a cold-storage room that has a temperature of 36° at one end and 30° at the other, apples, although alike when stored, will become overripe in the one place but remain in excellent condition in the other.

The degree to which the requirements can be filled depends on the management of all the processes through which apples must go on their way from tree to table, on equipment that is available for each process, and on the operation of equipment or the execution of each process. Progress in cold storage of apples begins with management of the movement of the fruit through the various processes of growing, harvesting, packaging, storing, transporting, and distributing.

No apples should be assigned for late storage unless they are of good quality. Those to be stored should be moved to the storage promptly. The length of storage period should be limited by the variety and quality of the fruit. Apples should be moved from storage while they still have enough life to withstand normal handling and exposure during transportation to market and distribution. Good storage can be wasted on apples poorly chosen for storage or poorly handled before and after storage, just as good apples can be lost by poor storage. This principle

is being applied more and more, and much of the current progress in apple storage is due to improvement in this kind of management.

The improvement of buildings and equipment can be traced from the early fruit cellar through the ventilated storage cooled by night air, to refrigerated storages that have come into common use in the past 20 years or so. Methods of applying refrigeration to apples have likewise been changing. In recent years the cooling is mostly accomplished by moving cooled air through the storage rooms rather than by having cooling coils spaced about the rooms. Perhaps the most common way to cool the circulating air in modern plants is to pass it through a spray of chilled brine.

The first objective in a refrigerated storage is to cool the fruit promptly and maintain a temperature at or near the optimum. If cooling is to be done quickly there will be a large demand upon the refrigerating machinery at harvesttime. A large volume of air must be circulated to distribute the refrigeration to all the stored fruit. Even after the apples are cooled, there is always some variation in temperature from time to time in a storage room, and the fruit in some parts of the room is necessarily warmer than that in other parts. Best storage conditions are those that will hold the variation in temperature to a minimum.

### Three Requirements

In order to effect prompt cooling and uniform low temperatures, three requirements must be met. The first is ample refrigerating capacity; in the Pacific Northwest this would be about 6 tons of refrigeration for each 1,000 field boxes of apples brought to the storage daily. The second is ample volume of air circulation; 1,000 cubic feet of air a minute for each ton of refrigeration is considered a minimum. The third requirement is provision for the air to move effectively among all the packages; this depends upon the arrangement of air ducts, freedom from obstruction to air movement through the room, and arrangement of the stacks of boxes to permit access of air.

The first and second requirements--ample refrigeration and air circulation--can be provided by machinery. A plant loaded beyond its capacity cannot cool the apples promptly.

The third requirement, good air distribution, is more than a matter of plant capacity. It calls for careful attention to detail in design and operation. A large number of methods of air distribution are in use. The simplest is to discharge the cold air through nozzles at one point in the storage room and pick up the return air near by. This is likely to result in a relatively wide range of temperatures in different parts of the room. Perhaps the most elaborate method is to discharge cold air from a large number of openings in ducts spaced through the room, and to pick up the return in an equal number of return ducts. With that method, the air velocities through the room may be slow. The most effective placement of ducts for providing uniform air distribution is a single discharge duct along one wall of the room and a single return duct along the opposite side. For good operation, the air is delivered to and returned from the room at the ceiling or near it.



Whatever the arrangement of the ducts, it is necessary to have a clear space at the ceiling throughout the room. Girders that extend across the path of air flow or packages stacked too close to the ceiling prevent free movement of air. Failure to leave an open space between stacks of packages results in poor circulation.

Even with plenty of refrigerating capacity and air volume, and with the best possible air distribution, absolute uniformity of temperature cannot be had. The air leaving the room will be warmer than that entering. For that reason, the fruit nearest the delivery openings is exposed to the coldest air. In the most modern plants, the variation in temperature of the fruit at different points is held to a minimum by automatically reversing periodically the direction of air movement. When this is done, none of the fruit is continuously exposed to the coldest air, and none to the warmest. When warm apples are brought into a storage room, it is desirable that they be cooled as quickly as possible. Reversing the air direction periodically permits using air as cold as 22° to 25° F. to get rapid cooling without danger of freezing.

For economy, several inches of insulation are used on all outside walls, the roof, and the floor. In the Pacific Northwest, as much as 24 inches of dry mill shavings are often used for insulating the roof of storage houses. Mineral materials are best for ground-floor insulation. They should be protected from ground water by a waterproof membrane. Wall and ceiling insulation is protected by a vaporproof lining between it and the outside air. No amount of insulation will totally prevent heat from coming through a wall or floor. Packages of fruit placed directly on a ground floor receive heat from the ground, and they are kept too warm.

#### Persistent Attention to Details Essential

Persistent attention to details of operation is essential even in the best apple storage. In a well-operated plant, packages are spaced so that air may move freely among the stacks and between the fruit and the walls. A clear space is left for air to circulate over the packages and under the ceiling at all points. Outside doors are not left open unnecessarily. Temperatures and conditions of fruit are observed regularly.

A number of apple storages are now equipped for effective reversed-air circulation. In constructing most of these plants, careful attention was given to refrigerating capacity, blower capacity, and all details that affect the distribution of air. Fruit temperatures in this type of storage both during the cooling period and after storage temperatures are reached, have shown that it represents a distinct step toward meeting all the requirements for highest apple quality. The modern apple storage can deliver crisp, juicy apples to consumers throughout the season under a management program that segregates apples most suitable for late storage from those that should be consumed early. Such a program accents the need for getting storage apples into storage promptly, preventing the overloading of storage facilities, and handling the fruit at all stages in conformity with program requirements.

## MARKETING BRIEFS:

Bakery Products.--Secretary of Agriculture Clinton P. Anderson'late in February proposed to the baking industry a tentative voluntary industry agreement to eliminate consignment selling. Provisions of the agreement would exclude the return of stale bread from retailers in excess of 1 percent of gross sales in any calendar month. Also excluded would be special discounts, rebates, gifts, and the like in connection with the sale of bakery products. Bakers would be requested to limit inventories of flour to 60 days' production requirements.

Cotton.--The export differential applicable under the terms and conditions of the Cotton Sales for Export Program is now 1/8 cent per pound of cotton, gross unpatched weight. The rate was changed from 1/2 cent per pound on March 3.

Dairy Products.--Effective March 1, Federal Order 42, which regulates milk handling in the New Orleans milk marketing area, was amended chiefly to (1) establish minimum prices for Class I milk (fluid milk and cream); (2) increase Class I differentials; (3) provide that skim milk and butterfat used in Class II (chiefly ice cream and ice cream mix) be priced separately; and (4) provide for an individual-handler pool instead of a marketwide pool.

Insecticides.--The following cautionary statement for manufacturers for use in labeling 2,4-D has been suggested by USDA: "Caution: Before using, consult agricultural authorities in your State. This dust may drift for miles, even on quiet days, and cause damage to susceptible plants such as cotton, beans, peas, etc. Use only when there is no hazard of drift. Do not store near fertilizers, seeds, insecticides or fungicides. After use of this dust, do not use same equipment for insecticides or fungicides" or give directions for cleaning the equipment.

Potatoes.--In a letter of February 26, addressed to the House and Senate committees on agriculture, Secretary of Agriculture Anderson urged that Congress give early consideration to the price support problem. He pointed out that "the time has come when we must give potato growers an indication of what to expect with regard to the 1948 crop. In the absence of any action by the Congress, this is the present situation: The Department of Agriculture will of course continue to support potato prices at 90 percent of parity until December 31, 1948, the end of the 2-year support period following the termination of hostilities, as provided by the Steagall Amendment. This is simply a matter of carrying out existing law, which offers no alternative. After that date, however, the Department does not plan to continue the price supports which are specified in the Steagall Amendment unless directed to do so by the Congress."

Tobacco.--The national marketing quota for 1948 burley tobacco has been increased from 474 million pounds, as proclaimed last November, to 514 million pounds. This increase will offset the difference of 40 million pounds between actual sales of about 485 million pounds and the indicated 1947 crop of 525 million pounds used in calculating the quota last November.



## ABOUT MARKETING:

The following publications, issued recently, may be obtained upon request. To order, check on this page the items desired, detach and mail to the Production and Marketing Administration, U. S. Department of Agriculture, Washington 25, D. C.

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Statement by Secretary of Agriculture Clinton P. Anderson before the House Foreign Affairs Committee regarding the European Recovery Program. January 22, 1948 16 pp. (Mimeographed)

Annual Summary of Carlot Unloads of Fresh Fruits and Vegetables at Washington, D. C., for 1947. (PMA) January 1948. 26 pp. (Mimeographed)

Compilation of Agricultural Marketing Agreement Act of 1937. (PMA) January 1948. 24 pp. (Printed)

Periodic Market Reports of the Production and Marketing Administration. (PMA) February 1948. 34 pp. (Multilithed)

Consumer Tips for Buying Eggs. (PMA) February 1948. 2 pp. (Multilithed)

Poster showing United States Standards for Quality of Individual Shell Eggs. (Color illustrations of appearance, both candled and broken out of the shell.) (PMA) February 1948. 2 pp. (Printed)

School Lunch Recipes Using Potatoes. (PMA and the Bureau of Human Nutrition and Home Economics) PA 36. January 1948. 17 pp. (Multilithed)

The Wholesale Market for Fruits, Vegetables, Poultry, and Eggs at Richmond, Va. (PMA in cooperation with Virginia Agricultural Extension Service) March 1948. 91 pp. (Mimeographed)

Meat Animals, Farm Production and Income, 1924-44: Revised Estimates by States. (Bureau of Agricultural Economics) September 1947. 152 pp. (Multilithed)

Commercial Truck Crops for Fresh Market: Acreage, Production, and Value by Seasonal Groups and States With Comparisons, 1947. (Bureau of Agricultural Economics) December 1947. 51 pp. (Mimeographed)

Save Farm-Stored Grain From Insects! (USDA Fact Sheet from information supplied by the Bureau of Entomology and Plant Quarantine) January 1948. 2 pp. (Printed)

The World Talks Over Its Food and Agricultural Problems. (Department of State) Publication 3002, Conference Series 105. December 1947. 7 pp. (Printed)

